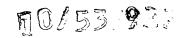COMPUTER SYSTEM PERFORMANCE ANALYSIS

The present invention relates to computer system server performance analysis and consequent enhancement of performance.

5

The focus of any commercial enterprise, particularly in relation to its Information Technology ( IT) infrastructure is in using IT to solve business-related problems. Problems and solutions are at the application/middle-ware (both being program elements which operate

10    or co-operate with an operating system) end which is where most  in-house expertise lies. Businesses rely on computer vendors for performance-capable systems on which their systems will run but the biggest and best systems are not necessarily in harmony with IT budgets nor with future capacity planning.

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Current performance analysis tools on the market do not answer questions related to perceived problems, merely presenting operating system and middleware measured operational statistics in graphical format or providing alarms when preset thresholds (requiring

20    expertise) are exceeded. As in-house commercial expertise usually focuses on higher-level applications and middleware such as Relational Database Management Systems (RDBMS), when there are perceived performance problems, an external (and expensive) performance consultant is often required to gather operating

25    statistics over a period of days, perform an audit of hardware and software running on the system or servers, analyse the running statistics relating application software problems to the operating system and hardware, and compose a report in problem and solution format, with attendant graphs and supporting material. The cost

30    associated with even the briefest of consultations may exceed that of a major component cost of a company's IT infrastructure, or even that of a budget. Consequently, there is a need for an inexpensive, automated system that can gather and analyse performance metrics from a server and deliver easily comprehensible problem

35    determinations and provide solution information.

To overcome the cost-centred limitations in the prior art described

above and to overcome other limitations that the traditional sale,
licensing and maintenance of performance analysing software would
impart, the present invention seeks to provide a method and
apparatus by which the end-user may engage in timely, efficient,
5    easily comprehensible performance analysis without necessarily being
conversant with any analysis techniques.

The present invention further seeks to provide a method and
apparatus where the target computer server has the option of
10   enabling automated corrective action to be taken by providing
computer instructions to  be issued and obeyed which  implement the
solution, thus achieving an immediate performance gain automatically
to achieve a technical effect in the form of a technical enhancement
of the performance of the analysed system..
15
According to a first aspect, the present invention consists in a
method for analysis of performance of a target computer system, said
method including the steps of: recording performance data from said
target computer system; sending said recorded performance data to a
20   remote analyser; said analyser analysing said recorded performance
data; said analyser, in response to the content of said performance
data, generating and providing a humanly readable report; and said
analyser sending said humanly readable report back to said target
computer system (or nominated alternative.
25
According to a second aspect, the present invention consists in an
apparatus for analysis of performance of a target computer system,
said apparatus comprising: recording means, operative to record
performance data sent from said target computer system to a remote
30   analyser; said analyser being operative to analyse said recorded
performance data; said analyser being operative, in response to the
content of said performance data, to generate and provide a humanly
readable report; and said analyser being operative to send said
humanly readable report back to said target computer system or
35   nominated alternative).

The invention further provides that the humanly readable report can

comprise problems and potential solutions thereto.

The invention also provides that the analyser can further produce and send to said target computer system, an instruction set, for use
5    at said computer system, said instruction set being operative to cause said target computer system automatically to apply said solutions.

The invention further provides that each solution from said
10   instruction set can be applicable conditionally upon approval by an end user.

The invention further comprises that said analyser is operative to analyse said performance data with respect to performance data
15   gathered on one or more previous instances of analysis of performance data from said target computer system.

The invention further provides that said target computer system can be in addition to a plurality of similarly analysed and reported
20   computer systems which are analysed by said analyser, and that said analyser can be operative to analyse said performance data with respect to performance data from one or more of said plurality of similarly analysed and reported computer systems.

25   The invention further provides that said one or more of said plurality of similarly analysed and reported computer systems are similarly configured to said target computer system.

The invention further provides that said analyser can be operative
30   to analyse said performance data with respect to performance data provided by one or more equipment or software manufacturers.

The invention further provides that said analyser can be operative to analyse said performance data with respect to performance data
35   provided by one or more equipment or software vendors or suppliers.

The invention further provides that communication can be through the

Internet, by cable, by satellite, or by private network.

The invention further provides that said analyser can send a
performance data gathering routine to said target computer system,
5      said performance data gathering routine being operative to gather
performance data from said target computer system.

The present invention discloses a mechanism and method by which an
end-user may transport system server performance metrics to a web-
10     enabled, automated performance analysis interpreter, which will then
generate a series of reports, retrievable by electronic mail and/or
interactive reports presented via a web browser. The system may also
generate scripted, automated corrective action which may be executed
by the target system which has been analysed.

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The present invention further seeks to provide a method and
apparatus capable of delivering a range of graded reports over, for
example, the Internet, or  a private network, ranging from easily
understood business-level problem and solution reports, to fully
20     specific technical reports.

The present invention is further described, by way of example, by
the following description, to be read in conjunction with the
appended drawings, in which:

25

Figure 1 is a schematic diagram showing an example of a computer
system and analyser and helps illustrate the interaction there-
between.

30     Figure 2 is a schematic diagram showing the architecture and
dataflow within the analysed computer system.

And

35     Figure 3 is a block diagram showing an example of the various
elements and their inter relationship in the analyser.

Attention is first drawn to Figure 1, showing a schematic diagram of
the various elements involved in the operation of the present
invention and their interactions with one another.

5      An e-commerce system is built around an end user site in the form,
       in this example, of a web server 10 . A performance analysis
       interpreter 12 and a relational database management system 14, which
       has access to a data storage database 16, are used to  interpret
       data from the web server 10.  Performance analysis statistics are
10     uploaded from the web server 10, as indicated by arrow 18,  and
       stored in the database 16 against the user's previously registered
       system details which may also be rediscovered or verified against
       the current data set being uploaded.

15     Data transfer, in this example, is via the Internet. It is to be
       appreciated that the present invention also encompasses data
       transfer by any means, or combination of means, including, but not
       limited to, private networks, satellite, and cable.

20     The performance analysis interpreter (PAI) 12 analyses the
       performance data received from the web server 10 and prepares a
       multi-level report which is lodged into the database 16. The end-
       user may interact the PAI 12 and the web server 10 via the end
       user's workstation or browser 20. The end user can receive the
25     report from the PAI 12 as indicated by arrow 22. The end user can
       download the performance data from the web server 10 and can send
       that data to the PAI 10, as indicated by arrows 24, 26. The end user
       can interact with the report, discovering recommended solutions to
       perceived problems or reviewing spare-capacity information. In the
30     case where dynamic configuration changes have been indicated, the
       end user may download a humanly readable copy of the change
       procedure for manual execution on the web server 10  under test.
       Equally, the end user can arrange for the web server 10 under test
       to download and execute the change procedure  automatically, so
35     effecting the recommended solution without further user
       intervention. The downloaded change procedure can be already in the
       form of machine instructions to be obeyed, or can be converted into

such instructions on receipt to alter the operating parameters of the devices and resources within the tested web server 10 so that better operation is achieved.

5    There are two main tiers of application strata. The first tier comprises the end-user environment 10 20. The second tier comprises the central analysis and storage environment 12, 14, 16.

Attention is next drawn to Figure 2, showing for example, the
10   various elements in the end user site, which, in this example, comprises the web server 10 of Figure 1.

The end-user environment 10 20 consists of one or more computer system 'servers' 10 running a range of supported operating systems
15   25 such as, but not limited to, UNIX (which can be any one of HP-UX, Solaris, AIX, Linux, True64), Novell Netware or Windows NT/2000 which are to be analyzed for performance measurement purposes. The operating system 25 can be any present or future operating system 25 capable of analysis for performance, or capable of receiving and
20   causing to operate a performance data gathering routine operative to analyze performance and operative to send, or to provide for sending, the performance data to the PAI 12.

A performance data collecting program or routine, in the form of a
25   System Information (SI) data collection agent 27 is downloaded from the central system 12 14 16 that interacts with a similarly supplied generic performance data  gathering routine or with one already resident within the user system's 10 operating system 25. The operating system's 25 gathered performance data is derived from the
30   operating system's 25 interaction with the applications and middleware 29 which are enabled by and supported by the operating system 25. The gathered performance data is collated and communicated by a data collection agent 31.

35   Generic performance data gathering routines gatherers typically report a snapshot of global performance counters at fixed time intervals as well as per instance of use for such things as an

application process, disc resources, communications resources,
networking interface, processor, and any other element, process or
utility used by the system under test, the values of the
performance counters changing  as  resource usage occurs. A data
5      collection agent is a collating and transmitting routine for
configuring and monitoring the performance data gathering routine,
taking a snapshot of current hardware and operating system
configuration data and coordinating this data upload through
Internet channels (http or smtp) either on end-user 20 demand or by
10     automated schedules, to the PAI 12 and its associated equipment 14
16. The  data collection agent is also operable to compressing
messages bearing collected performance data and is further operable
to providing encryption and decryption to messages for use where the
end-user requires message privacy.
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Attention is drawn to Figure 3, showing the various parts of the
central performance analysis facility 12 14 16.

The central performance analysis facility 12 14 16 consists, in this
20     example, of one or more Unix-based servers 28 providing an e-
commerce enabled web application, which permits the end-user 20 to
upload performance metric data sets under the control of the data
collection agent from the end-user's systems 10, initiate the
performance analysis interpreter (PAI) 12 to transform uploaded data
25     sets into multi-level interactive reports, and browse generated
reports or request e-mail summaries be delivered.

The web server 28 e-commerce application, in this example, is based
on Apache running on a Unix platform with Perl programming
30     environment integrated into the httpd servers. Other options are
possible, which will be apparent to the person, skilled in the art.

The web server or servers 28 can receive performance data as
indicated by arrows 15, can send out a humanly readable report as
35     indicated by arrow 17, and can send out solution instruction sets as
indicated by arrow 19.

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The Performance Analysis Interpreter (PAI) 12 is itself written in Perl with interface modules to a local Relational Database Management System (RDMS) 30 from which it retrieves the SI performance data set to be analyzed, previous SI result sets from

5   the same target system, and is operative to acquire related SI data sets and result sets from other similar systems (those with similar application profiles) and is further operative to acquire and hardware/software vendor supplied performance profiles from one or more vendor Relational Database Management Systems (RDBMS) 32.

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The PAI 12 uses classical performance analysis methods to determine where and when the system under analysis 10 has been exhibiting poor performance and/or excessive resource usage with respect to hardware capacity, installed resources, patterns of resource usage and

15   previous observed behavior on the same or similar systems already in the database.

Once bottlenecks have been identified, the PAI identifies culprits or the processes which comprise all or specific parts of the

20   application being executed by the system under analysis.

For each type of bottleneck, particularly those being exhibited either concurrently or most recently, the PAI 12 gauges the effect of each bottleneck on the others to determine the effect should its

25   impact be negated. After this analysis, surviving bottlenecks and their attendant culprit lists are used to generate potential solution lists, which form the basis of the top level, solution-orientated reports. The entire determination data structures are used to form the basis of the technical, navigable reports.

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The PAI 12 generates daily, weekly and monthly reports (depending upon the request by the user) from the data that is held in the SI developed repositories.

35   In essence, the PAI 12 interprets technical operating system measured performance data into a human comprehensible language (HCL), preferably, but not necessarily, English.

The above describes an architecture, method and mechanism by which
systems performance analysis and enhancement may be made automatic
and efficient, capable of rendering performance data as a series of
5   human-readable problem and solution reports.

As previously stated, the present invention also provides for
automated application of the solution or solutions proposed by the
problem and solution reports. The PAI (12) can reduce the content of
10   the problem and solution report to a modification instruction set
which can be sent to the end user's browser 20 for staged, optional
application by the end user to the web server 10, or directly to the
web server 10 for automatic application by the web server 10, to
modify the working parameters, message routing and resource
15   allocation, to name but a few aspects of the web server 10, towards
the web server 10 providing an improved performance.

Apart from the technology within the performance analysis
interpreter (PAI) 12, the centralized approach to performance
20   analysis negates the need for the traditional cycle of analysis
software sales and licensing, and more importantly, maintenance.
End-users will always be analysing their systems using the latest
analysis engine, supported by the latest hardware/software vendor
information combined with the results of other analyses and
25   automated quality assurance checks and procedures.

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